Workshop on Partnering Strategies for Educating and Motivating the Next Generation of Aerospace Scientists and Engineers

Sustaining U.S. Leadership in Science and Technology - One University Perspective -

Tom I-P. Shih

Aerospace Department Chair Association

Sponsored by NASA Aeronautics Research Mission Directorate (ARMD)
with NASA Exploration Systems Mission Directorate (ESMD)

Thursday, June 1, 2006
Washington, DC

Yogi Berra once said:

"The future ain't what it used to be."

In response to Norm Augustine's "Rising above the Gathering Storm," Newt Gingrich recently said at Iowa State University:

The change in the next 25 years will be 6 or more times than those in the last 25 years.

To understand what that means, it is as if we are in 1875 and trying to plan for 2025.

We live in extremely exciting times!

There are many challenges - but there are also many opportunities.

When things can change so quickly, no one has the upper hand.

Only those **constantly vigilant** and **constantly prepared** to take advantage of the opportunities will win.

How do we prepare / educate this and future generations to succeed in an increasingly “flat” and fast-changing world?

How is the aerospace sector different from other sectors? Why does it require special attention?

What are the Issues

Resources - The Enablers

- Corporate/Institutional Knowledge Base
- Experimental and Computational Facilities
- Funding to Support Innovation, Research, …

Leadership - Enabling the Right Things

- Principles and Values
- Meaningful Assessment
- Commitment, Stability, and Consistency

Workforce - Students and Faculty

- ITAR: Who do we trust?
- Jobs in the U.S.: Will there be any? Where?

Resources - The Enablers

Corporate/Institutional Knowledge Base

This is the bread and butter of U.S. leadership and competitiveness.

The U.S. leads, but the leadership is eroding.

The knowledge base must be passed from generation to generation. Is it when people are disposed of as if they are commodities?

NASA's leadership / coordination should be invaluable for the aerospace sector.

Resources - The Enablers

Experimental and Computational Facilities to Enable the Work and the Education

U.S. universities are stagnating, while universities in other countries are building up RAPIDLY.

Funding to Support Innovation, Research, …

We are **behind** other countries in the support of graduate students.

Aeronautics is especially difficult because NSF does not fund it and NASA's aeronautics budget is decreasing. Latest efforts by ARMD are in the right direction.

Leadership - Enabling the Right Things

Lasting Principles vs. Political Correctness

integrity, fairness, openness, societal good vs. expediency

Values vs. Sensibilities

hard work, perseverance, patience, high aspirations vs. excuses

Substance vs. Flash and Popularity

excellence, quality vs. numbers and words

Long-Term Commitment vs. Lip Service

From the movie “Dave”:

We need to think about what is good for the country instead of what is good for me.

Workforce - Student and Faculty

ITAR

Best & brightest from the U.S. only? Or do the best & brightest come from all over the world?

Is closing our university's research to foreigners good for U.S. competitiveness? Shouldn't we continue to take advantage of the brain drain? Are we missing out on knowledge enabled by this synergy? When has closing doors helped? When has opening doors to the talented hurt us? What are we protecting?

Will U.S. universities be segregated into those who accept ITAR projects and those who won't? Will U.S. universities have segregated labs - one for U.S. students and one for foreign students? Is this what America is about?

Workforce - Students and Faculty

Jobs in the U.S.

If there are no jobs, then no one will enter our profession regardless of how exciting we make it appear.

Observation 1:

U.S. aero industries want mostly B.S. & M.S. graduates.
European & Asian aero industries want mostly Ph.D.s

Why? One possible reason:
- U.S. aero industries have depended on corporate knowledge, are mostly systems integrators, and don't want to pay Ph.D. salaries

Workforce - Student and Faculty

Observation 2:

Many people think that aerospace engineers can **only** design airplanes and spacecraft.

Many students do not major in aerospace engineering because they think that they cannot get jobs outside the aerospace sector, which has a reputation for up-and-down employment.

People need to understand the broad education aerospace engineers receive!!!

Workforce - Students and Faculty

Observation 3:

If we lose manufacturing capability, then we will lose innovation and technology.

Just look at the industry that we are giving up in automotive electronics… because U.S.-based industry out-sourced the manufacturing.

Innovations are often in the details of the work. If we don't make them, we won't know what the problems are.

Workforce - Student and Faculty

Observation 4:

Wall Street is not loyal to a country.
Wall Street is loyal only to **sustained** quarterly profits!

The only way to keep jobs in the U.S. is to ensure that the U.S. continues to lead in the development and ownership of leading technologies – whatever they might be!

The U.S. aero industry needs Ph.D.s, U.S.-based manufacturing, and strong links between universities, industry, and government labs.

What are the issues?

Resources - The Enablers

- Corporate Knowledge Base
- Experimental and Computational Facilities
- Funding to Support Innovation, Research, etc.

Leadership - Enabling the "Right" Things

- Principles and Values
- Meaningful Assessment
- Commitment, Stability, and Consistency

Workforce - Students and Faculty

- ITAR: Who do we trust?
- Jobs in the U.S.: Will there be any? Which ones?

Remarks

Today, for the first time in a long time, we are challenged by the world – not by wars but by beating us at our own game of American ingenuity.

Remarks

Garry Kasparov:

To be truly great, you need great enemies or great competitors.

This challenge is a wonderful opportunity!

Bottom Line

We need

- A highly innovative, vigilant, and prepared workforce that will be in the right place at the right time.

- An infrastructure that sustains innovation at universities and national laboratories that look beyond the immediate.

- To enhance the status of engineers, mathematicians, and scientists in our country so that our best and brightest will aspire to careers in those professions.

We sincerely hope this workshop will start to move us in the right direction as a nation.